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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

ALANKO, ANITA KAREN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 11/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/601,148	<b>Applicant(s)</b> DONALDSON ET AL.	
	<b>Examiner</b> Anita K. Alanko	<b>Art Unit</b> 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 11/15/05 amdt.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) 8, 12, 20 and 29 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7, 9-11, 13-19 and 21-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

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***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/14/05 has been entered.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

*Claims 21-22 and 24-26 rejected under 35 U.S.C. 102(b) as being anticipated by*

*Silverbrook (US 6,019,457).*

Silverbrook discloses a printhead forming method comprising:

forming a fluid-handling slot (Fig.6-9) extending between a thin-film surface of a substrate (“FRONT”) and a generally opposing backside surface of the substrate (“BACK”);

the slot extending along a long axis that lies generally parallel to the thin-film surface, wherein the slot has a cross-section taken transverse the long axis that is defined, at least in part, by one sidewall,

wherein at least a first portion of the sidewall is generally parallel to the thin-film surface of the substrate (the connection between 113 and 114), and

wherein a second portion of the one sidewall is generally perpendicular to the thin-film surface (the sidewall of 113), and

wherein a third portion of the sidewall extends from the second portion to the thin-film surface of the substrate and defines an obtuse angle with the second portion as measure through the slot (sidewall of 112).

As to claim 22, Silverbrook discloses that the method comprises forming a slot portion into the backside surface of the substrate (Fig.7, col.6, lines 56-60) and etching the substrate to remove substrate material proximate the slot portion to form the fluid-handling slot (Fig.8-9, col.6, lines 60-64, col.7, lines 1-5).

As to claims 24-26, Silverbrook discloses to use multiple removal steps (Fig.6-9), including dry etching with a patterned hard mask (glass overcoat, col.6, lines 50-55).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

*Claims 1-7, 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hawkins et al (US 5,006,202) in view of Milligan et al (US 6,273,557).*

Hawkins discloses a method formed by the method comprising:

forming a first pattern masking layer 34 sufficient to expose a desired area of a first surface 12A of a substrate 10 (SiO<sub>2</sub>, Fig.3, col.5, lines 25-29);

after forming the first patterned masking layer, forming a second patterned masking layer 14 (Fig.6, col.6, lines 43-46) sufficient to expose less than the entirety of the desired area of the first surface (col.6, lines 37-42, 29C smaller than 29A);

forming a slot portion in the substrate through the second patterned masking layer (Fig. 7); and

removing additional substrate material to form a fluid-handling slot (Fig.9).

As to amended claim 1, Hawkins disclose to form fluid-handling passageways and ejection chambers 23, 28 over a first surface of the substrate (Fig.16). Hawkins fails to disclose the order cited, that of masking, forming and removing subsequent to forming the passageways and ejection chambers. However, since the same final product is formed, it is obvious to vary the order of the steps since there is no criticality given to the order. In general, the transposition of process steps or the splitting of one step into two, where the processes are substantially identical or equivalent in terms of function, manner and result, was held to be not patentably distinguish the processes. *Ex parte Rubin* 128 USPQ 440 (PTO BdPatApp 1959).

Milligan teaches to form passageways and firing chambers before masking and etching to form slots in a substrate (Fig.4A-6C). Therefore, it is still further obvious to vary the steps as cited because Milligan teaches that this is a useful technique for forming printheads.

As to claim 2, Hawkins discloses a hard mask (thermal oxide, SiO<sub>2</sub>).

As to claim 3, Hawkins discloses forming a photoresist layer 30 (Fig.5, col.6, lines 26-29).

As to claim 4, Hawkins discloses etching the slot portion (col.6, lines 48-51).

As to claim 5, Hawkins discloses a through region positioned between two shallow regions (shelf 39, Fig.10).

As to claim 6, Hawkins discloses wet etching (col.6, lines 59-64).

As to claim 7, Hawkins discloses removing a portion of the second patterned masking layer (col.6, lines 56-57).

As to claim 9, Hawkins discloses a fluid-feed slot forming method comprising:  
patterning a hard mask 34 on a substrate surface sufficient to expose a first area 12A of the first surface;

forming a slot portion (Fig.7) in the substrate through less than an entirety of the first area of the first surface, the slot portion having a cross-sectional area at the first surface that is less than a cross-sectional area of the first area (since 29C is less than 29A); and,

after forming the slot portion, etching the substrate to remove material from within the first area to form a fluid-handling slot (Fig.9).

As to claim 10, Hawkins discloses to form a subset since the etched area is smaller than the original exposed area.

As to claim 11, Hawkins discloses covering the entire first substrate surface with the hard mask (Fig.1) and subsequently removing hard mask material from the first area of the surface (Fig.3).

*Claims 13-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hawkins et al (US 6,303,042) in view of Milligan et al (US 6,273,557).*

Hawkins discloses a print head substrate forming method comprising:

exposing a first portion 520a of a substrate surface through a hard mask 520 (Fig.5a);  
forming a photoresist 522 over the hard mask and the first portion;  
removing at least some of the photoresist to expose a second portion of the substrate surface thorough which a slot portion is to be formed (Fig.5a);  
dry etching the substrate through the photoresist sufficient to form the slot portion (Fig.5b, col.10, line 54); and,  
after said dry etching, wet etching the substrate to form a fluid-handling slot (Fig.5c, col.10, line 60) without a re-entrant profile.

Further as to claim 13, Hawkins is directed to forming a nozzle plate. Nozzle plates are conventionally used in combination with fluid passageways and ejection chambers in order to form the final printhead product. It would have been obvious to one with ordinary skill in the art to vary the order of the steps since there is no criticality given to the order and thereby form the same final product, by forming the nozzle plate after the ejection chamber and passageways. In general, the transposition of process steps or the splitting of one step into two, where the processes are substantially identical or equivalent in terms of function, manner and result, was held to be not patentably distinguish the processes. *Ex parte Rubin* 128 USPQ 440 (PTO BdPatApp 1959).

Milligan teaches to form passageways and firing chambers before masking and etching to form slots in a substrate (Fig.4A-6C). Therefore, it is still further obvious to vary the steps as cited because Milligan teaches that this is a useful technique for forming printheads.

As to claim 14, Hawkins does not explicitly disclose to apply the hard mask over the entire substrate surface and removing hard mask from over the first portion. Hawkins merely

discloses that a patterned layer is formed. Examiner takes official notice that deposition and removing is a conventional way to form masks. It would have been obvious to one with ordinary skill in the art to apply and remove the hard mask as cited in claim 14 because it is a conventional and useful technique for forming masks.

*Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US 6,019,457) in view of et al (US 2003/0141279 A1).*

The discussion of Silverbrook from above is repeated here.

As to claim 23, Miller discloses sand drilling as mechanical cutting and multiple dry etching steps (paragraphs [0059], [0057]), and patterning a hard mask [0056]. It would have been obvious to use these techniques in the method of Silverbrook since Miller teaches that they are useful for forming inkjet printheads.

*Claims 27-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US 6,019,457).*

The discussion of Silverbrook from above is repeated here.

As to claim 27, Silverbrook does not disclose to use lift-off. Examiner takes official notice that lift-off is a conventional technique for forming patterned layers. It would have been obvious to one with ordinary skill in the art to use lift-off to pattern hard mask in the method of Silverbrook because it is a conventional and useful technique for forming masks.

As to claim 28, Silverbrook does not disclose to use wet etching, rather Silverbrook discloses to use isotropic etching. Isotropic etching may comprise wet etching, but it is not



necessarily wet etching. However, Silverbrook teaches that plasma etching should be avoided in order to avoid damaging the heater 120 (col.7; lines 5-7, col.6, lines 34-67)

It would have been obvious to one with ordinary skill in the art to use wet etching as the isotropic etching method in the method of Silverbrook because wet isotropic etching is cheaper and saves money compared to plasma etching and because Silverbrook teaches to avoid plasma etching in order to avoid damaging the heater.

*Claims 21-26 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al (US 2003/0141279 A1).*

Miller discloses a printhead forming method and a print cartridge incorporating a print head die formed by the method comprising:

forming a fluid-handling slot in a substrate wherein a first portion of the sidewall is parallel (bottom surface of slot) to a first surface of the substrate, and a second portion of the sidewall is perpendicular to the first surface (sidewalls of slot, Fig.9d or 9f).

As to amended claim 21, Figures 9g and 9h show slots generally parallel to the thin-film surface (the plane coming in and out of the page) and portions of sidewalls at an obtuse angle (the curved part of the sidewall).

As to claims 23-26, Miller discloses sand drilling as mechanical cutting and multiple dry etching steps (paragraphs [0059], [0057]), and patterning a hard mask [0056].

***Response to Amendment***

The claims remain rejected over Hawkins '202, '042 and Miller. The rejection of claims 21-22 and 27-28 over Milligan is withdrawn, see reasons below. Silverbrook is newly applied in rejections of claims 21-28, see the rejections above.

### ***Response to Arguments***

Applicant's arguments filed 11/14/05 have been fully considered but they are not persuasive, to the extent that they still apply.

As to the rejection of claim 1, applicant argues that Hawkins does not teach that the second masking layer exposes less than the entirety of the area of the surface of substrate 12. Examiner disagrees, see Figure 6 where mask 14 exposes less of 12A than as shown in Figure 3, 29A.

As to the rejection of claim 3, applicant argues that the "act of forming a second patterned masking layer comprises forming a photoresist layer" is not taught or suggested. In response, layer 30 is used to form the second patterned mask, and is a photoresist (Fig.5).

As to the rejection of claim 9, applicant argues that the second masking layer does not expose less than the entirety of the area of the substrate surface 12. In response, see the remarks above under claim 1. Examiner notes that this is not commensurate in scope with the claim language. Examiner also notes that since the mask exposes less than the entire area, that the etch also etches less than the entire area.

As to the rejection of claim 13, applicant argues that Hawkins appears to disclose a structure that does not extend from a second surface to a first surface of the substrate. However, this is not commensurate in scope with the claim language. Also, the claim is open to having

multiple substrates, not just one substrate, and the slot portion is not explicitly linked to the wet etching step (the fluid-handling slot is not linked to the slot portion).

As to the rejection of claim 21, applicant's point is well taken that Milligan does not teach the sidewall with an obtuse angle from the second portion to the thin-film portion of the substrate. Rather, the obtuse portion is between the parallel and perpendicular portions. Also, Milligan does not suggest to use wet etching, as in the context of claim 28. Rather, Milligan suggests to use wet etching (Fig.9A) followed by dry etching (Fig.9B). Silverbrook is newly applied in a rejection over claim 21, see the rejection above.

The arguments about the rejection of claim 21 over Miller are not persuasive since the curved sidewall extends from the perpendicular sidewall (Fig.9j).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K. Alanko whose telephone number is 571-272-1458. The examiner can normally be reached on Mon-Fri until 2:30 pm (Wed until 11:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 1765

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*Anita K. Alanko*

Anita K Alanko  
Primary Examiner  
Art Unit 1765